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Fluorescence, FT-IR and UV-reflectance changes which accompany bismaleimide/diallybisphenol-A resin cure are reported for three cure schedules. The formation of succinimide moieties is attributed to Ene, Diels-Alder, and alternating copolymerization reactions involving phenylmaleimide and allylphenol groups. The formation of 2-propenyphenol vinyl groups is attributed to Ene reaction between allylphenol groups and maleimide groups, as well as by direct isomerization of allylphenol. The destruction of 2-propenylphenol vinyl groups is provided by UV-reflection spectroscopy. Evidence for Diels-Alder reactions followed by re-aromatization processes is provided by UV-reflectance spectroscopy. Fluorescence signals are initially quenched, but increase and then level off as the resin cures. Model compound studies indicate that emissions that occur at 356nm when the resin is excited at 280nm are from the phenolic portion of the resin, while emissions that occur at 440nm when the resin is excited at 380nm are from phenyl-succinimide. Structure arising from Diels-Alder-Ene and alternating copolymerizataion reaction sequences have also been confirmed by model studies. Support that the final stages of cure involve re-aromatization of phenolic groups and crosslinking reactions of 2-propenylphenol vinyl groups is presented.							
14 SUBJECT TERMS  Fluorescence, FT-IR, UV reflectance, bismaleimide, diallybisphenol-A, Ene, Diels-Alder and Alternating copolymerization Reactions.					15. NUMBER OF PAGES  2 16. PRICE CODE		
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The extent of imidization for several polyamic acids was investigated by using charge transfer(CT) fluorescence at a longer wavelength. The fluorescence excitation near 460nm showed red shifts and their intensities decreased as the imidization proceeded. Fluorescence solution study confirmed the origin of CT complex formation. These spectral changes were correlated with the extent of imidization. The fluorescence of the CT complex is a sensitive indicator of the extent of imidization of aromatic polyamic acids.					
14. SUBJECT TERMS Imidization, polyamic acid, p fluorescence	colyimide, charge trans	sfer complex	15. NUMBER OF PAGES 2 16. PRICE CODE		
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Monitoring	the rea	ction of an aromatic diar	nine cure agent with epox	v by fly	
technique was used f	for cure	characterization of the i	nterphase in epoxy/glass a	y by mu	orescence
composites. The eff	ect of t	ne various surface treatm	ents was first studied by t	and epox	y/carbon
obtained by using a	avo <del>rta</del> r	loto for along on a madif	ied quartz plate for carbor	ne mode	interphase
treated quarts gured	quartz j footor o	nd showed in second see	ed quartz plate for carbor	1 surrace	. Aminosilane
showed almost no of	Tasici a	the arms laimetics in a sur	e extent, while water agin	ig and air	roxidation
model aerhen surfee	a cir on	ule cure kinetics in com	parison to the untreated qu	uartz sur	face. For a
The effects	e, air o	didation showed a faster	reaction only at the early	stage of	cure.
the actual comments	or the v	arious surface treatment	s on glass or carbon fiber	were als	o studied with
In the actual composite	s made	by a min coating of epor	cy-diamine melt on the me	odel inte	rphase system.
fraction court of the case of epoxy-	-carbon	liber composite, both an	r oxidation and water agin	ig treatm	ent showed a
laster cure reaction a	it the ea	rly stage of cure. Further	rmore, air oxidation treat	ment for	the
epoxy/carbon liber c	omposi	ite snowed somewhat inc	reased cure extent. The re	easons fo	or these trends
have been discussed.	•				İ
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4. SUBJECT TERMS					
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fluorescence technique, surface treatment, glass fiber and carbon fiber composites.				16. PRICE CODE	
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UV/Visible reflection spectroscopy coupled with a bifurcated fiberoptic probe has been developed as an in-situ monitoring technique for polymer reactions. Thermal imidization of 4,4'- (Hexafluoroisopropylidiene) diphthalic anhydride(6FDA) and p-phenylene diamine(PDA) was monitored in-situ by measuring UV reflectance of the sample during its cure. Deconvolution of the reflectance spectra allowed quantitative assay of the amic acid to imide conversion in 6FDA/PDA. A new class of high temperature resin based on phenylethynyl endcapped polyimide p repolymers has also been investigated by UV/Visible, fluorescence, and IR spectroscopy. Cure reaction, involving only the endgroups, was found to be measurable only by IR, and to some extent by fluorescence, but not by UV reflection. The paper also discusses the issues involved in the use of a bifurcated optical probe in obtaining high sensitivity in reflectance measurements.					
14. SUBJECT TERMS UV/Visible reflection spectr imidization, phenylethynyl e			15. NUMBER OF PAGES  2  16. PRICE CODE		
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6. AUTHOR(S) H.J. Paik and N.H. Sung					
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Cure Reactions in 4,4'-bismal system has been investigated with observed to show a fluorescent compared to other common around stable even at those elevations.	th bifurcated fiberor ce emission at ~590 matic molecules. That ted cure temperaturound 550nm, which	otic fluorimeter. BMI, Onm, an unusually long e spectra was not subjectes. According to United that he led us to believe that	the key monomer itself, was ger wavelength region when ct to photobleaching, and was V-Vis analysis, a very weak		
shoulder peak was observed at a BMI might be responsible for systematic blue shift of the emis BMI/DABPA by monitoring the bifurcated fiberoptic fluorime temperature through out the cur	ssion peak upto 60n is characteristic fluo ter, the spectral sh	m. An attempt was morescence peak position	he cure process, there was a ade to follow the reaction of shift. Using a custom-built,		
BMI might be responsible for systematic blue shift of the emis BMI/DABPA by monitoring th bifurcated fiberoptic fluorime	ssion peak upto 60n is characteristic fluoter, the spectral she cycle.	m. An attempt was magnetic management of the masses of the	he cure process, there was a ade to follow the reaction of shift. Using a custom-built,		

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Abstract—Cure characteristics of epoxy in the epoxy/fiber interphase in composites can be studied using an evanescent wave fluorescence technique. This paper describes the methodology and instrumentation which allows in situ monitoring of epoxy reactions at the interface. The reaction of a stoichiometric mixture of diepoxide. diglycidyl ether of bisphenol-A (DGEBA), and the curing agent 4,4'-diaminodiphenyl sulfone (DDS) is followed by measuring the fluorescence intensity change of the externally added reactive dye, diaminoazobenzene (DAA), as it is converted from a primary amine to a tertiary amine state during cure. By using a sapphire optical fiber as an evanescent wave probe, the fluorescence intensity can be measured within an approximately 150 nm thin layer of epoxy at the fiber surface. A high refractive index value and the good UV—visible transmission character of the sapphire make it the only fiber acceptable as an evanescent probe for DGEBA/DDS epoxy. A number of optical innovations are introduced to maximize the evanescent wave intensity, which include a polymer cladding for the sapphire fiber and metallization of the fiber tip. Cure reaction in the interphase region is compared with that of bulk epoxy.					

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